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Career Orientations of R&D Engineers in a Large Aerospace Laboratory

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The purpose of this paper is to explore the career orientations of engineers. Although much has been written on this general subject, the data presented in this paper will identify characteristics of people with three different career orientations and should add substantially to data provided by earlier investigators.

In recent years, research focused on careers has been particularly fruitful in the study of work in organizations. The study of careers is useful because it focuses on the fundamental link between individual and organization and involves the study of how each party attempts to influence the behavior of the other. It is this basic link that serves as the basis for collective action.

The term "career" has been used to describe everything from vertical progression up an organizational hierarchy (Hall, 1976) to a non-work related series of diverse life experiences (Goffman, 1961). The definition that is used here is stated by Hall (1976), "A career is the individually perceived sequence of attitudes and behaviors associated with work related experiences through the span of the person's life." Although according to this definition, a person's career is defined retrospectively, it is important to remember that career is not a static concept. It is dynamic, in that it changes as perspectives change or reframe. Hall emphasizes that dynamic nature of a career.

> Careers develop, or people develop during the course of their careers. Development involves growth or learning over time. A person's stage of development today is very much a product of the stimulation, reinforcement and learning he experienced yesterday. Therefore, it is not only the person's job which influences his or her career development, but also the job history, the total history of influences in the work environment.

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A career, therefore, is not merely a vocation or some distinct occupation, but encompasses the individual's understanding and interpretation of work related experiences. Since a person's concept of career is influenced by present and past work experiences, the perception of one's career can change somewhat with each new job or assignment. (Katz, 1978)

Just as a person defines or interprets the direction of previous work experiences, he is also likely to have some career goals or aspirations which guide his thinking about future progression in a career. A given engineer will not only have some definition of his career to date, but will also be likely to have some idea of what he would like to do in the future. Even if there are no specific goals for the future, the individual will almost certainly have some level of career aspiration. The clarity of these goals or aspirations will vary by individual (Zaleznik, Dalton, Barnes, 1970), but it is unlikely that many people will be without some degree of aspiration.

The goals and aspirations of a person can be influenced by a variety of factors. Personality, perceived competence, previous job history, self-image, work values and interests as well as non-work related values could all have an influence on a person's career aspirations. An example could be a manager who is approaching mid-career. Research (Buchanan, 1974; Hall, Schneider, 1973) has shown that at mid-career, an individual begins to take stock of what has and has not been attained. Often times, this "taking stock" involves a reassessment of personal competence and skills. This kind of re-evaluation may cause a shift in career goals and aspirations.

Another example of the kind of factor which could affect career goals is Schein's (1974, 1978) concept of a "career anchor." He states that people seem to have career anchors, which are "patterns of self-perceived talents, motives and values," and which help to guide a person through their career. While he has defined five such anchors (and posits the existence of at least three more), each is essentially an "occupational self-image" which probably does not change throughout a person's career. The anchor emerges as a result of the interaction of a person's values and work experiences. As a person grows older and more experienced, the anchor is more easily identified. Its identification is a simultaneous process of creation and discovery.

The anchor concept is interesting in this context because it is an aspect of self-concept which may influence a person's perception of their career (both past and future). The goals and aspirations are probably more susceptible to change than the anchor for at least two reasons. First, the occupational self-image is only one of several factors which could change a person's goals or aspirations. Such expectations can to some extent be controlled or influenced by the reward structure of the organization where the engineer works. Second, while one's career may appear stable in retrospect, it may not seem that way as it is happening. Job changes or new self discoveries may seem like radical alterations from previous patterns when they occur, only to fit a more encompassing pattern in retrospect. Career goals may shift several times in the course of a work life, based on immediate and current work experiences. The anchor may remain stable despite these fluctuations.

Along with a person's career goals or aspirations are a set of expectations about conditions that will lead to the fulfillment of those

goals or the attainment of aspirations. These expectations concern what kinds of jobs, job characteristics, assignments or experiences will best prepare the person to reach his goals. They determine, in part, what is considered desirable or undesirable about any career related experience. This set of expectations is a sort of map, against which a person's career progress is charted or matched, to check and see if he is "on target" or "on course." Since these expectations are a result of a person's goals, they can be expected to shift in accordance with changes in aspirations.

It is this combination of goals or aspirations and the associated set of expectations that will be referred to as a person's career orientation. If career is defined as the ex post facto definition of a person's work experience, career orientation concerns the aspirations and expectations for the future. It is somewhat difficult to talk about career orientation apart from some definition of past experience, since the previous work history contributes so much to a person's career goals, but the focus for this paper will deal with individuals' perceptions and expectations of the future. These perceptions and expectations provide direction and a sense of continuity for the future. A change in career orientation is possible because there are constant changes in the variables that influence it. Despite this possibility for change, career orientations are probably relatively stable over time.

Local/Cosmopolitan Concept

Much of the work that has been done on career orientations among professionals has been based on a conceptual model first proposed by

Merton (1949) and later elaborated by Gouldner (1957). As first proposed, this model separates people into one of two categories, local or cosmopolitan, according to the level of their professional commitment. Gouldner (1957) defines each group as follows:

> Cosmopolitans: those low on loyalty to the employing organization, high on commitment to specialized role skills and likely to use an outer or professional reference group orientation.
>
> Locals: those high on loyalty to the employing organization, low on commitment to specialized role skills and likely to use an inner or organizational reference group orientation.

Shephard (1956) adds to this, saying that a research staff is likely to be separated into locals and cosmopolitans.

> The former are oriented toward success as members of their profession, and their interests in the company is limited to its adequacy as a provider of facilities for them to pursue their professional work. Since they are productive, they may be valuable to the company, but such value is an almost accedental by-product of their work. The locals are good company men, but their interests is likely to be less in their work than in their advancement in the company.

This initial view of professional differences rests on the premise that these orientations are considered to be polar opposites, representing two ends of a single continuum. Considerable early research supported that initial premise (Marcson, 1960; Gouldner, 1957; Shephard, 1956; Kornhauser, 1962). Since that initial conception, however, several researchers have suggested that commitment to a profession and commitment or loyalty to an organization should be considered as being independent of each other. Therefore, a person could be high or low on either dimension. This led to consideration of an increased range of career orientations (Pelz, 1956; Goldberg, Baker, and Rubenstein, 1965; Berger and Grimes, 1973; Goldberg, 1976).

The local/cosmopolitan concept appears inadequate for several reasons.

It is not so much a measure of personal career orientation as it is a measure of commitment to, or affiliation with a larger social system. It is a static concept, somewhat inconsistent with the dynamic concept of career being used here. It really neglects the individual's own experiences as well as their aspirations and expectations for the future.

Even if one overlooks the inadequacies of the concept, there are problems when it is applied to engineers. The entire local/cosmopolitan framework is based on the premise that a person's level of commitment to their work organization can be contrasted with their commitment to orientation toward a well defined professional organization. Recent researchers, however, have noted that the local/cosmopolitan dichotomy may not be well suited to engineering, since engineering may not be as "professional" a vocation as is often assumed. In a rather complete review of the literature involving careers of engineers, Kerr, Von Glinow, and Schresheim (1978), identify six characteristics of a profession which can be used to rate difference occupational groups along a professional continuum. These six criteria are as follows:

* Expertise, normally stemming from prolonged specialized training in an abstract body of knowledge
* Autonomy, a perceived right to make choices which conern both means and ends
* Commitment to the work and to the profession
* Identification with the profession and with other professionals
* Ethics, a felt obligation to render service without concern for self-interest and without becoming emotionally involved with the client
* Collegial maintenance of standards, a perceived commitment to help police the conduct of fellow professionals

Based on these issues, Kerr at al report that engineering really does not meet the criteria for being a profession. Although there does

seem to be an abstract body of knowledge, engineers typically lack the other criteria for professionalism.

They are not alone in that conclusion. Several others (Miller and Wager, 1971; Shepard, 1961) have presented similar findings, indicating that on the whole, engineers are much more "locally" than professionally involved. It is unlikely, therefore, that one would find as many professionally oriented, or cosmopolitan, people among engineers as would be found among scientists. Since the local/cosmopolitan concept attempts to capture professional identification or allegiance, it seems less applicable to engineers, than to other, more professional groups (Allen, 1977).

In summary, the local/cosmopolitan construct, when applied to engineers, appears to blur as many distinctions as it creates. It is useful in providing a distinction between those whose personal commitment is either to their profession or their employing organizations. This measure of professional commitment, however, tells us little about the particular goals and aspirations of engineers (career orientation, as it is used here) and how those aspirations and expectations affect attitudes. In addition, engineering as a whole is more "locally" or organizationally oriented, so the vast majority of engineers fall within one of the two broad categories created by the concept. This would be important if our goal were to understand differences between professions, but it does little to illuminate differences in orientation within the "local" category.

There have been other attempts to go beyond the local/cosmopolitan concept in understanding career orientation. Bailyn (1978), in a study of MIT graduates, was able to segregate people into work and non-work

orientation. This segregation was based on respondents' comments about where they felt the greatest sense of satisfaction. Work oriented engineers were then divided into "people" or "technical" oriented groups, and work satisfaction was examined for each. These typologies begin to explore some important career differences among engineers, but they still lack a sense of future direction. Zaleznik, Dalton, & Barnes' (1970) work on career orientation separates people into "oriented" and "conflicted" categories. In essence, oriented people have some definition of their career goals, and their current interests and activities are congruent with those goals. Conflicted people have no such clear sense of direction. These people are more confused about their careers, and feel at the mercy of environmental changes which determine which course their careers will take. This conception is important because it indicates that some people are able to clearly decide which direction their career will take, while other people are less clear about their career progression.

These considerations begin to clarify some of the issues involving career orientations. Among a given group of engineers, some will be clear about their future career paths while others will not. Among those who are, there will be different career orientations (goals and aspirations, along with expectations of conditions which will lead to attainment of those goals) based on the different rewards and career paths offered within that organization.

Rewards and Goals

Although literature on career orientations has indicated that there is some variation among engineers, there appears to be a consistent belief among researchers about the rewards that engineers value. While

some research indicates that some engineers may be motivated by the intrinsic rewards of their work (Koppelman, 1977), most people believe that the real goal of the vast majority of engineers is progress up a managerial ladder. Goldberg (1976), for example, notes that organizationally and professionally-oriented engineers seek promotion and progression up a managerial ladder. He indicates that the "locals" value such managerial positions because it links them more closely to the organization. The more professionally oriented engineers have the same aspirations, because it is a signal to both themselves and their peers that their contribution is valued. In an effort to counter this belief Sofer (1971) suggests that some engineers do not want the managerial responsibility, and find greater satisfaction by progression up a technical ladder or hierarchy. Critics of this "dual ladder" approach maintain, however, that positions on this "technical hierarchy" are not highly valued or respected by engineers, since such positions often constitute only "second class" managerial spots, which are essentially powerless (Ritti, 1972). Among most, the assumption remains that if you are going to "make it," you can only do so by becoming a manager.

Several factors could help clarify this issue. It may well be that a dual ladder system could be effective in very specific kinds of organizations. Organizations that are very professional in nature, and which emphasize basic research may find that the dual ladder is an effective reward system. Also, dual ladder system may work in organizations in which promotion up the technical ladder is not viewed as a trivial reward. In these cases, the technical promotion may well be a powerful and respected position.

Recently, some reports have noted what may be new trends among engineers. The Columbia Career Bulletin (1979) reports that in some R&D organizations, managers are asking to be taken off the managerial track and put back into technical positions. Although anecdotal, these data may indicate that some engineers value the technical work they do more than they value progress up any hierarchical ladder. Bailyn (1978) also notes that in general, there is less tendency to define a career only in terms of progress up a managerial ladder. Alternative career goals and lifestyles are becoming more prevalent and more accepted.

Friedlander (1971), in an article analyzing a variety of professions, presents what he thinks are three different career orientations. The first two, profession and local, correspond closely to descriptions of people who choose to progress up either track of a dual ladder system. These are people who want to be promoted, but who, because of their different interests, choose different advancement tracks within the organization. The third category is interesting because in some sense it is a hybrid of the other two. This group of people, called "researchers" by Friedlander, are technically oriented but are more committed to their employing organization than to the profession. They were high performers technically and chose to stay involved in the technical aspects of their work. The study itself was lacking detail about all three groups (it was a factor analytic study taken from a multi-professional sample) but it is helpful in outlining what may be three different career orientations. The first orientation may involve promotion or advancement up a technical ladder, a second may involve promotion through traditional managerial paths, and the third may be held by people who are involved in the techncial details of their work, but who do not seek our further organizational advancement.

A problem with the Friedlander study was the lack of detail about the differences among people with these three career orientations. This paper will attempt to investigate whether three such orientations do exist among engineers within a single research and development laboratory. If people with these three orientations are found, the differences among them will be explored.

Before proceeding, it may be worthwhile to briefly state some of the implications deriving from the existence of differing career orientations. One implication is that job satisfaction may be affected or influenced by a person's career orientation.

Zaleznik, Dalton, and Barnes (1970) state that satisfaction is not a state of mind directly influenced by job characteristics, but it is a "function of both an individual's expectations and the extent to which his expectations are realized." Expectations about career development or movement toward a career goal could be serious determinants of satisfaction with a given job. Koppelman (1977) has shown that people at different age-related career stages value certain job aspects and rewards differently, and could therefore be differentially satisfied with the same job. This would appear to indicate that career orientation could affect which job characteristics and rewards are valued. By trying to reward all engineers the same way (offering rewards associated with managerial responsibility and progression.), organizations may ignore individual differences in orientation.

RESEARCH METHODS

The Organization

The organization from which this sample was taken is a large R&D laboratory located in the northwestern United States. It is in close proximity to several universities, and in some ways the organization itself tries to maintain an academic atmosphere. It's projects draw heavily upon aerospace and electronics technology and are supported by U.S. Government contracts.

The laboratory is organized around the principal customer agencies. Projects that are undertaken do not usually lend themselves to quick solutions, so people tend to work on the same projects for a relatively long time (mean = 4.5 years). The present sample, which represents about 50% of the lab's technical staff, was selected from those divisions which service the three main customers. The sample group is strongly dominated by engineers. Although there are some people who were trained in different disciplines, the general feeling among the people in the lab is that they are engineers and should be considered as such.

The Instrument

The questionnaire that was used to collect the data contained questions in a variety of areas, five of which were used in this study.

A. Organizational Opportunities. This set of questions asked about the importance associated with a variety of job opportunities. Eight opportunities were listed, including the chance of working on challenging projects, on projects leading to organizational advancement, on projects that allow greater freedom and autonomy, as well as several others. This scale was originally developed by Pelz and Andrews (1961) and has since been used by other investigators (Smith, 1971).

B. Problem Solving Approaches and Motivation. A set of questions was included which captures the different ways that engineers approach problem situations. Six questions were used to measure whether engineers preferred general or detailed investigations, abstract concepts or concrete observations, and long or short range time perspectives. These questions were developed by Pelz and Andrews (1961) but have been used by several other researchers (Steers and Braunstein, 1976; Smith, 1971).

In addition, this section contained four items designed to measure need for affiliation and need for achievement. These concepts were first developed by McClelland (1956) in his work on motivation. The questions used in this section were developed and validated by Steers and Braunstein (1976).

C. Job Characteristics. This set comprises a combination of items developed originally by Hackman and Lawler (1971) and the Michigan Survey of Organizations (1972). The questions cover a variety of job characteristics, including autonomy, professional contribution, importance to the organization, and others. The items used in this questionnaire are drawn from a larger set of items used in earlier research.

D. Leadership Characteristics. Two different sets of questions were used to measure leadership characteristics. One set of questions (20 items) was taken from the Michigan Survey of Organizations. It asks about a variety of managerial characteristics, including feedback, influence both inside and outside the lab, and perceived competence. The second set of questions about leader characteristics gave the respondents the chance to rate their supervisor on ten descriptive statements. This scale was taken from French and Raven's (1959) work on the bases of power. Both sets of questions were altered somewhat to fit the demands of the study.

E. Career Orientation and Organizational Reward. This set of questions was developed specifically for the project. The first three questions deal with career orientation, and the next three deal with the respondent's perception of how the organization rewards high performance.

In addition to these questions, a variety of demographic data was gathered by the instrument. This data included items about age, organizational and project tenure, attendance at professional meetings, and several other items.

All items (except the demographics) were rated on a seven point Likert scale (1 = lo; 7 = hi)

Data Collection

The sample population was brought together in small groups and given a brief explanation of the purpose of the study by the principal investigators. Participation in the study was completely voluntary, so every effort was made to enlist their support. The respondent's project was named on the outside of the questionnaire, but the respondent was otherwise anonymous. Follow-up reminders and letters of thanks were sent to remind people to fill out the questionnaire. This effort resulted in a return rate of better than 80%.

FINDINGS

As an empirical measure of career orientation, the subjects were asked to answer three separate questions about how they perceived their careers. The questions asked the extent to which individuals saw their career as a progression up a technical ladder, a progression up a managerial ladder, or simply a movement from challenging project to challenging project, irrespective of organizational promotion. Each person responded to all three questions by indicating on a scale the degree to which each of the three possibilities described his own career.

Looking at the mean response levels and intercorrelations of these three questions (Table I), two things are apparent. First, engineers in this organization tend to stress the project orientation over each of the other two ladders. Second, while all the orientations are to some degree distinct, the strongest differentiation appears between the project response and the two measures of organizational progression

TABLE I

Intercorrelations among three career preferences

Extent to which individuals see their careers as a movement:	Mean (n=366)	Managerial ladder	Project to project
up a technical ladder	4.1	.39*	.10
up a managerial ladder	3.5		-.26*
from project to project	5.1		

* $P < 0.001$ level

Research by Zaleznik, Dalton and Barnes (1972) has shown that some people have a clear sense of their career orientation, while others are

less certain of their future direction among the three. The data were divided on this basis.

Those people who had rated one of the career orientation questions higher than both of the other two were classified as "oriented." (Table II) Those people whose scores on any one item was not greater than the other two were considered "non-oriented." For example, an engineer who marked the technical ladder question a "5" and the other questions a "4" would be considered "oriented". Seventy-two percent of the sample population fall into the oriented category. The focus of the rest of the study will be on the people in this oriented category. Clearly, a great deal of data is ignored by this classification and this focus, but the emphasis in this study is on career orientations and therefore, the decision was made to focus on people who gave some indication of certainty about their career preference.

TABLE II

Proportion of engineers with clear career preferences.

	N	Proportion
Oriented (one category rated higher than both others)	256	72%
Non-oriented (no single orientation preferred)	101	28%
Total	366	100%

To determine whether there would be people who fall into all three of the career orientation categories discussed earlier, the oriented group is subdivided according to which of the three career orientations is preferred. Based on their highest score, people were placed into one of the three career categories. For example, people who had a higher score on the technical ladder question than on both of the other questions were placed in the technical ladder group. In this way, all the people who had indicated a career preference were assigned to a category reflecting that preference. (Table III).

TABLE III

Distribution of career preferences

	N	Proportion of oriented group	Proportion of total sample
Technical ladder orientation	44	17%	12%
Managerial ladder Orientation	46	17	13
Project Orientation	175	66	48
Total	265	100%	72%

As expected, there was a significant number of people in each of the three orientation categories. The most surprising is the number of people who preferred the project orientation category. The number of people in that category was nearly four times greater than either of the two other categories, and makes up nearly one half of the entire research sample.

It was expected that there would be a significant number of people who did not view their career as a progression up any hierarchical ladder, but the size of this group was still surprising. The bias towards being more interested in the challenge of the work than in any organizational advancement was stronger than anticipated. Since the intrinsic challenge of the work appears to be a major source of motivation within the organization, the traditionally accepted local vs. cosmopolitan dichotomy appears to blur as many distinctions as it creates. An engineer, for example, could be a "local" or "cosmopolitan" and still have any of the career orientation preferences.

Due to the extremely large group of people in this project category, it was thought that there may be an organizational bias or norm which affected people's responses to this question. For example, in a case where a person puts a score of "6" on the project orientation question, and a "5" on both of the other questions, did the higher score really represent a personal affinity toward a project to project career orientation, or was it more a representation of the organizational culture? To clarify somewhat the problems associated with this orientation, the criteria for classification into the "project" career orientation category were tightened. Instead of requiring that only a one point difference exist between the project score and the scores on the other two orientation questions (A>B), a two point difference was required (A>(B+1)). This tightened standard resulted in the project career orientation category (and therefore the oriented group) being reduced by fifty people. Although this reduced the size of the sample, it increased the probability that this category represents people who have a project career orientation. The increased clarity seemed to

offset the cost involved in reducing the sample. (Table IV)

TABLE IV

Adjusted Distribution of Career Preferences

	N	Proportion of oriented group	Proportion of total sample
Technical ladder Orientation	44	20%	12%
Managerial ladder Orientation	46	21	13
Project Orientation	125	58	34
Total	215	100%	59%

The three career orientation categories shown in Table IV will serve as the basis for the rest of this paper. Further analysis will investigate what differences exist among these three groups. The three categories are probably not exhaustive, but do represent three distinct career progression paths available within an organization.

Neglected by this focus are those people who did not fall into one of the three orientation categories. These are people whose career focus is not as singular as those who expressed a clear preference. A wide variety of people are in this category, since it could include people who have no focus at all to their career as well as those who are focusing on more than one of the career outcomes mentioned in the orientation categories. Due to this lack of homogeneity, these people are not considered in this study. Little analytic clarity is gained by adding them at this point. Further research is necessary in order to better

understand the characteristics of the people in this diverse group.

Demographic Data

Individuals indicating different career preferences differ somewhat in their background characteristics and overall job satisfaction (Table V). The average age of those in the technical and managerial ladder categories are quite similar but those with a project orientation are nearly six years older. In addition, project oriented people have greater work experience within the laboratory (organizational tenure) as well as longer work experience outside the laboratory. The differences in age and experience for the three orientation categories are significant, but it is unclear at this point just how age affects peoples' career orientation. It may be that as people grow older, they find fewer and fewer advancement opportunities available to them. They may therefore develop

TABLE V

Demographic Data

	Age	Work Experience in lab. (years)	Work Experience other (years)	Proportion currently in managerial position	Education Phd	Education Ma	Education Bs
Technical ladder Orientation	38.0	3.0	9.5	14%	17%	55%	29%
Managerial ladder Orientation	37.3	4.0	9.2	43	9	48	42
Project Orientation	43.7	4.6	13.1	16	11	39	50

more "realistic" expectations about their future development. On the other hand, it could be that people with greater organizational tenure have higher salary and benefit levels. This increased level of comfort

may allow people who are more interested in the engineering work to forgo the increased responsibilities that come with hierarchical advancement, and focus on that aspect of their work that gives them the greatest pleasure. At this point, it is still unclear which hypothesis is more tenable.

The level of education among people in the three orientation categories was considered a measure of professional involvement. The two technically oriented categories were expected to have the highest levels of education. This was not entirely true. The technical ladder group did have the highest level of education, with 72 percent of the people in that category holding an advanced degree. In contrast only 57 percent of the people with a managerial orientation and, most surprisingly, 50 percent of those with a project orientation had graduate degrees. Several factors could account for the apparent discrepency. The difference in education could be considered a measure of professional interest, but it may be strongly influenced by age. Older engineers may not have felt the need, nor had the opportunity for advanced education. Younger engineers, faced with ever more complex technology may have considered advanced education to be of greater importance.

Another factor which may explain the lower educational level of the project group directly involves the definition of career orientation. People with a lower level of education may realize that it is unlikely that they will move up in the organization, and therefore they see movement from project to project as the only possibility for career progression.

A priori, it might be expected that all of the managers would fall into one of the first two categories, and that the managerial ladder category in particular would be dominated by managers. To some extent, this turned out to be true, but there were some surprises. The majority of oriented managers (58 percent of the managers were in the oriented group) are found in the first two categories, but a surprising number show a project orientation. Even in the managerial orientation, the number of managers did not exceed the number of non-managers. That a significant number of people who have already been promoted on a managerial ladder can state that they see their career as something other than a progression up the managerial ranks is an indication that perception of the future, as well as an evaluation of the past, goes into an individual's definition of career.

The technical ladder group was expected to be the most professional in outlook and would therefore try and stay closer to developments within the profession than those people with other orientations. This was true for the most part, but again, there were some surprises. Two variables could be considered as indicators of professional interest. (Table VI). The first is the number of professional journals read regularly. The people in the project orientation category had the highest score on this variable. The managerial group read the least. The second measure of professional involvement is the number of professional meetings each person attends in a year. The people in the technical ladder orientation attended the greatest number of meetings and the managerial group attended the least. It is not surprising that the two technically oriented groups (technical ladder and project) should have the highest professional involvement. The relatively

low measure of professional involvement for the managerial group is also not startling, and is one of the key differences between the three orientation categories.

TABLE VI

Additional Background Data

	Journals read	Conferences attended	Mean job satisfaction score
Technical ladder Orientation	2.0/mo.	1.4/yr.	5.1
Managerial ladder Orientation	1.7/mo.	0.9/yr.	4.6
Project Orientation	2.2/mo.	1.2/yr.	5.1

Differences in satisfaction scores are also noteworthy. This is a simple measure, designed to measure an individual's general satisfaction with the organization. The satisfaction score for those with a managerial orientation is lower than the scores of either of the remaining two categories. Although the exact reasons for its lower satisfaction level are not entirely clear, it may well be that the small number of managerial jobs available to engineers cause people with this orientation to feel more frustrated with their situation than people who have aspirations and expectations that are more likely to be fulfilled.

A summary of the data presented so far reveals some distinct differences between the three orientation categories.

A. Technical Ladder Orientation. Based on the criteria used to create the orientation categories, it was expected that this group would be more professionally involved than the other two. This seemed

to be the case. They are relatively young and have less than average work experience (both in and outside the laboratory). They are also the best educated group, and seem to stay informed about professional developments by reading professional literature and attending professional meetings. Of the three categories, people in this group are least likely to already be managers.

B. Managerial Ladder Orientation. This group was expected to be the least professionally involved. This also turned out to be true. This group also has less than average work tenure although their outside experience exceeds that of the technical ladder group. Their education level, the number of journals they read and their attendance at professional gatherings would indicate that they are the least professionally involved of the three groups. People who have this orientation are the most likely to already be managers, but their general satisfaction level is below average.

C. Project Orientation. Least was known about this group before starting, and the demographic data only begin to illustrate how they differ from the others. People in this category are more like those in the technical ladder category than those in the managerial ladder group. Although the average education level is relatively low, interest in the profession is slightly above average, and well above that found among people in the managerial ladder category. They are considerably older and more experienced than people in the other categories, and seem to be generally satisfied with their jobs. Although only 10 percent of the people in this category are managers, 45 percent of all the oriented managers are found in this group.

Attitudes and Values

In order to add to our knowledge of the differences between people in these three career orientation categories, three different sets of questions were analyzed. The first of these concerned what kinds of opportunities people felt were important. The second set of questions was designed to highlight differences in the approaches people took to problem solving. The third measures how people expect to be rewarded for high performance. Each set of questions was expected to highlight other differences that exist between these three groups of people.

Importance of Opportunity Scales

As mentioned, these questions were developed to determine how personally important people found a variety of work opportunities. Any given job can be thought to offer certain opportunities or advantages. For example, one project may offer work that is likely to have high visibility within the organization and therefore have a high probability of leading to organizational advancement. On the other hand, the work associated with that same job may be extremely routine and involve working with less competent colleagues. People were asked to rate which opportunities they considered most important. It was expected that people with differing expectations about their future development would value these work characteristics differently.

The questions and mean scores for each orientation category are presented in Table VII. On most questions there is little or no significant variation among the groups. On three of the items, however, there do seem to be significant differences. Two of these questions deal with the engineering profession. The first concerns building a professional reputation and the second addresses the importance of

working on projects important to the profession. On both of the questions, the technical ladder group had the highest score, and on both, the project orientation group had the lowest score. The technical ladder group appears to value opportunities that offer enhancement within the profession more highly than the other two groups. The management ladder group had a score very close to the technical ladder people on the "professional reputation" question. This may be an indication of interest in the profession, but is more likely to be a result of ambiguity in the question. For someone with a technical orientation, the term "professional reputation" will probably be understood

TABLE VII

Organizational Opportunities

"How much importance do you attach to each of these opportunities?"	Technical ladder	Managerial ladder	Project Orientation
to be able to carry out and pursue my own ideas.	5.8	5.8	5.9
to build and establish my own professional reputation.	5.9	5.8	5.1*
to work with colleagues of high technical competence.	6.2	6.0	6.1
to work on technically challenging tasks and projects.	6.3	6.1	6.4
to work on those projects that are most important to this organization.	4.6	5.0	4.5
to work on projects that will lead to my organizational advancement.	5.0	5.7	3.9*
to work on those projects whose technical problems and issues are most significant professionally.	5.1	4.7	4.5*
to have the freedom to be creative and original.	6.1	5.9	6.0

to refer to one's reputation within the profession. For someone with a managerial orientation, however, the term may mean something different, referring instead to one's career or work reputation.

The question on which the greatest difference in scores was found deals with the importance of working on projects that are likely to lead to organizational advancement. Although there is a significant difference between the technical and managerial ladder groups, the greatest disparity in scores is between these groups and those people with a project career orientation. This is very consistent with the criteria used to create the categories. People who see their career as a movement up a managerial ladder are going to value projects that lead to promotion more than people who see their career only as a movement from project to project. The technical ladder people are also concerned about advancement, but not to the same degree as those with a managerial orientation.

From this set of questions, further insights can be gained about the characteristics of the people in each of the groups. The technical ladder people value opportunities which would allow them to increase their knowledge of the engineering profession as well as improve their own standing in the professional community. Their above average score on the question involving organizational advancement is an indication of their desire to progress hierarchically. However, their preference for working on projects that are professionally, rather than organizationally important, sets them apart from the people with a managerial orientation.

The management ladder group scored higher than both of the other groups on only two questions, and both questions involved issues concerning the employing organization. They valued the chance to work

on organizationally important projects and projects that would lead to organizational advancement. People in this group are concerned about building a reputation within their company, but not necessarily within their profession. In general, they are less concerned about issues involving the engineering profession than the other groups.

The people in the project orientation group had the highest score on only one item, and that concerned working on projects that are technically challenging. The scores of all three groups were high for this question, so this alone does little to distinguish this group from the others. Combined with this high interest in challenging work, however, is a reduced interest in either technical, (within the profession) or organizational advancement. The importance of a project to the profession or organization appears to be of much less concern than the inherent or intrinsic challenge of the work.

Problem Solving Approaches

This set of items proposed a variety of approaches that people take in their research. Respondents were asked to rate each of them according to how well it described their own style. For example, one person may generally prefer to delve deeply into a subject, while another may prefer only to understand the broad outline of a project. The six items used in this section constitute the polar opposites of three different issues. (Table VIII) It was expected that three groups would be characterized by different styles or preferred approaches to problem solving.

TABLE VIII

Problem Solving Approach and Motivation Scales

General vs. Specific	Tech. lad. orientation	Mgr. lad. orientation	Project orientation
I prefer to spend enough time to find general principles that apply to many situations.	4.8	4.1	4.7**
I find it more difficult to utilize concrete observations rather than relying on abstract concepts.	5.5	5.2	5.1
Breadth vs. Depth			
I enjoy mapping out the broad features of new areas and leave the details to others.	3.5	4.3	3.6**
I prefer to find immediate solutions to specific problems.	4.3	3.0	4.1*
Short vs. Long Range Time Perspective			
I prefer to find immediate solutions to specific problems.	5.0	4.9	4.9
I like to plan a long range series of related tasks, which I then follow systematically.	4.7	4.6	4.2
Need for Achievement			
I do my best work when job assignments are fairly difficult.	5.3	5.5	5.3
I try very hard to improve on my past performance at work.	5.8	5.8	5.2
Need for Affiliation			
I work best in collaboration with others.	4.6	4.8	4.7
I prefer to do my own work and let others do theirs.	4.3	3.5	4.5*

* Sig. differences between groups- .01 level

**Sig. differences between groups- .05 level

General vs. Specific

These two questions were designed to measure peoples' preference for using either general abstract concepts or more specific, concrete observations in problem solving. Only one of the two questions in this section (I prefer spending time developing general principles) shows significant differences among the group scores. On this question, the two groups that are more technically oriented both score higher than the management ladder group. This indicates a preference for utilizing or developing some theoretical or conceptual constructs in research, as opposed to focusing only on the details. All three groups would rather deal with concrete observations rather than abstract concepts, but the two technically oriented groups add to that a willingness to develop or use theoretical constructs. Developing general principles out of the concrete observations takes more time and more detailed involvement than the managerial ladder people are willing to invest. There is some question whether these two items address the same issue. Taken individually, however, they do increase our understanding of the people in each of the groups.

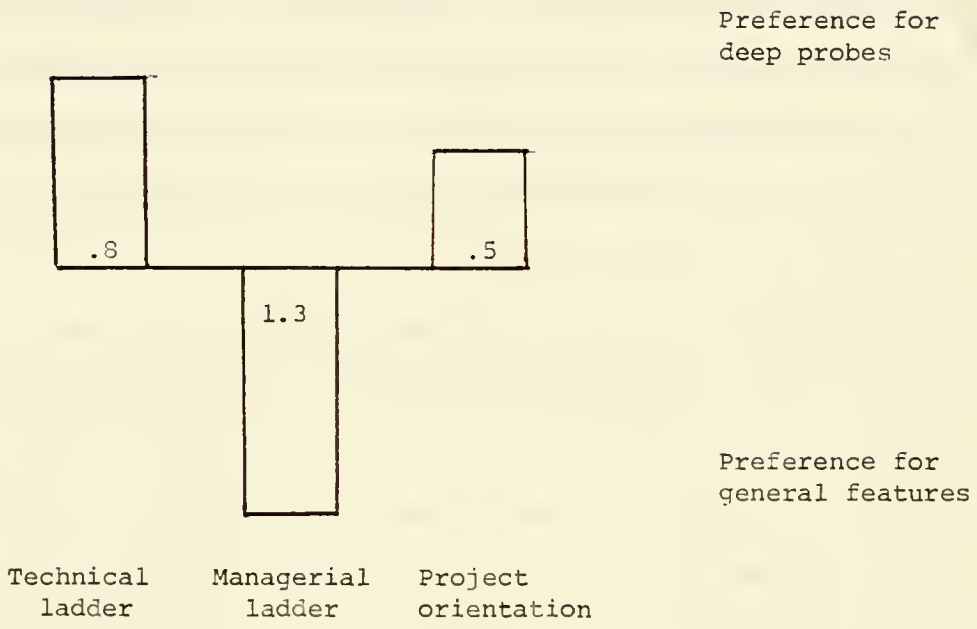
Breadth vs. Depth

These two questions seek to assess peoples' preference for either deep, narrowly focused probes or for understanding only the broad general features of a project. It is quite clear (Table IX) that the managerial ladder group much prefers the less detailed, broader approach to problem solving, while the two more technically oriented groups prefer a deeper, more detailed approach. These results should not be surprising. The results of earlier parts of this analysis have shown these two groups to be

much more concerned about the technical aspects of their work.

TABLE IX

Breadth vs. Depth



Short vs. Long Range Time Perspective

As with the other sections, two questions were used here to determine whether people preferred developing and implementing long range plans or simply finding immediate solutions to problems. Once again, there is some question whether the two items measure different ends of the same issue. All three groups enjoyed finding immediate solutions, but only the two advancement oriented groups seemed to enjoy developing and following through on long range plans. There did not seem to be major differences between groups on these items but the project oriented people did seem to prefer finding immediate solutions over planning and implementing long range plans

Motivation

Along with these three problem solving scales, two other scales were contained in this set of questions. These two scales were designed to

assess peoples' need for affiliation and need for achievement.

Developed by McClelland (1956), both are conceptual constructs dealing with motivation. The scales themselves were developed and validated by Steers and Braunstein (1976) (Table VIII). The measurement of motivational drive using several two item scales is extremely rough, but given the exploratory nature of this research, even rough measures can add to an understanding of people with different career orientations.

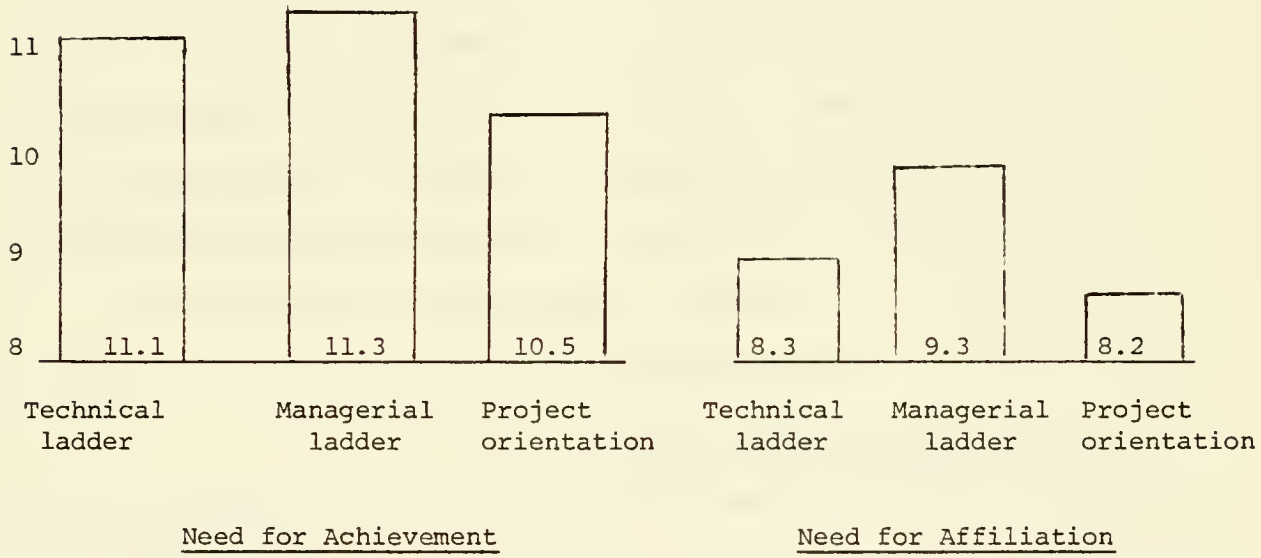
It stands to reason that the two advancement oriented groups would show the greatest need for achievement, and the data appear to support this. (Table X) The project orientation group show the least. As in earlier scales, only one of the two items used in this scale really captures the differences between groups. The item concerning performance on difficult assignments shows little variation between groups. In an earlier part of this analysis (see section on Work Opportunities) it was shown that all engineers in the sample seek out and enjoy challenging assignments. It is not surprising, therefore, that all three groups do perform well on demanding projects. The item concerning improving on one's past performance more clearly demonstrates the differences between people in these career orientation categories. The people in the project oriented group see much less reason to improve on past performance than do those people who most value advancement.

The scale measuring need for affiliation is also illuminating. From the graph in Table X, we can see that the managerial group shows the greatest need for affiliation. The other two groups appear less concerned about working with others and show a much greater preference for doing their own work. This compliments an earlier finding which indicated that people with a managerial orientation most wanted to

explore the broad features of a study, leaving the detailed work for others. Someone who prefers dealing only with the broad outlines of a project must be willing to collaborate with those doing the more detailed work. Otherwise, little could be accomplished. People who want to become more deeply involved are more likely to be willing to do their own work. In fact, by becoming deeply involved, they may become so specialized that they find it difficult to collaborate with others.

TABLE X

Need for Achievement and Need for Affiliation



The data from these five scales are quite helpful in understanding the people in each career orientation category. These data are consistent with what has been shown earlier. A quick summary shows that of the three orientation categories, those in the managerial ladder group have the highest need for achievement and for affiliation. They seem to enjoy developing and implementing long range plans, but prefer

to become involved only with the broad features of a project, avoiding the more detailed work.

The technical ladder group was also charactertized by a high need for achievement, particularly manifest in a desire to improve on previous performance. This group showed less need for affiliation than did those in the managerial ladder category. People having this orientation preferred to become involved with the details of a work assignment, and were the most willing apply or develop some general or theoretical principles from their work. They too enjoyed outlining and executing long range plans.

The people in the project orientation category were notably different from the other two groups. Like the technical ladder people, they preferred detailed involvement in projects and also preferred to use their knowledge of those details to develop some general principles or concepts. Of the three groups, however, they showed the lowest need for achievement and affiliation.

Expectation of Organizational Reward

The third set of questions concerned peoples' perceptions of how the organization tends to reward high performance. These questions asked people to indicate the probability (given high performance) of their being rewarded by movement along various career tracks.

As noted earlier, a person's career orientation is a function of that person's career goals or aspirations, as well as their expectations about the conditions that will lead to that goal. It involves how people see their careers developing and unfolding in the future. Peoples' expectations about future progression are based on their perceptions of how others have progressed or how they have progressed in the past.

People with a given career orientation were expected to perceive the organization as rewarding high performance by moving them along the path they had chosen. In other words, three people having different career orientations would be likely to perceive that same organization as rewarding high performance in three different ways. In short, there should be a tight connection between a person's goals (orientation) and perceptions of organizational reward.

Operationally, therefore, when the three questions dealing with career orientation are correlated with the three organizational reward questions, the highest correlations should be along the diagonal which represents a match between orientation and expectation of organizational reward. The data in Table XI bear out the supposition that a person's orientation affects his perception of how the organization will reward him if he performs well.

TABLE XI

Expectation of Reward by Organization

To what extent do you view your career as a movement:	High performance in this organization is likely to be rewarded by movement: up a technical ladder	up a managerial ladder	from project to project
Up a techncial ladder	.41*	.15	.15
Up a managerial ladder	.26*	.55*	-.15
From project to project	.01	-.24*	.42*

(N=215) *p<.001 level

The mean score for each group on the organizational expectation question are presented in Table XII. As expected, the highest mean scores were those where the organizational reward matched the career orientation. The only exception was in the technical ladder orientation. For this group, the expectation of being rewarded by being given challenging projects was about equal to their expectation of being moved up a technical ladder. This indicates that there may be few opportunities available for technical progression and that advancement along that track is unlikely.

TABLE XII

Correlations of Satisfaction with Perception of Organizational Reward

	Expectation of Reward by Movement:					
	Up technical ladder		Up managerial ladder		From proj. to proj.	
	$\bar{X}$	corr. with satis.	$\bar{X}$	corr. with satis.	$\bar{X}$	corr. with satis.
Technical orientation (n=44)	4.5	.37	3.5	.25	4.6	.17
Managerial orientation (n=46)	4.1	.04	5.2	.53	3.7	.30
Project orientation (n=125)	3.6	.31	2.8	.30	5.1	.39

The data in Table XII show that there is intra-category consistency. (Each orientation matches with the appropriate reward) It is also noteworthy that there is inter-category consistency. For each potential organizational reward, the highest scores were those of the matching orientation category. It is also important to note that for each orientation category, the greatest degree of satisfaction is associated

with the matching organizational reward.

These data afford increased understanding of people in each of these career orientation categories. Each group has a different perception of how the organization tends to reward high performance. A person's career orientation appears to influence his perception about the organization. The opposite might well be true, but the data make this explanation unlikely.

Summary

A summary of what has been learned about people in each of the three career orientation categories would be useful at this point. The characteristics of each group have been derived from differences in mean scores, which often mask a wide range of individual variation. However, the central tendencies of each orientation category on a variety of work oriented characteristics do seem to be consistently and appreciably different.

Technical Ladder Category

People in this group are relatively young and have the least work experience. They are, however, the best educated group and they continue to upgrade that education by attending professional conferences. In addition to having the highest level of conference attendance, people in this group also read several professional journals per month. They appear to be satisfied with their work, and are the least likely to already be a manager.

The focus of their interest is two fold. First, they enjoy detailed involvement in the work that they do, preferring to explore problems deeply and thoroughly. They prefer work that is demanding and challenging.

In doing their work, they are most likely to use or develop theoretical constructs.

The second area of interest involves their desire for progression up the technical ladder of their organization. Although they want to make a contribution to their profession (valuing projects that are significant professionally and which could enhance their professional reputation), they share with people in the managerial ladder group a high need for achievement. They are particularly concerned about improving on their past performance. Their need for affiliation is low, which may help explain why they do not seek advancement up a traditional management ladder.

While this group would prefer that future progression come through a technical ladder, they realize that future movement from one interesting project to another is equally probable.

Managerial Ladder Orientation

The average age for these people is the lowest of any of the three groups. These people have the least organizational tenure, but do have considerable experience outside the laboratory. Although over half the people in this group have a post-graduate degree, they are the least well read professionally and are least likely to attend professional conferences. Almost half of the people in this group are already managers, but as a group, they have the lowest satisfaction level of any of the three orientation categories.

The primary concern of this group is to develop as a manager in their organization. This does not mean they dislike doing engineering work, but rather that their primary interests do not lie in that area. More than any of the other groups, these people highly value working

on projects that are important to the organization and which are likely to lead to organizational advancement. Since they prefer not to become involved in the fine details of a project (concerning themselves primarily with the broader features) it is not surprising that they show the highest need for affiliation of the three groups. Like people in the technical ladder group, they have a high need for achievement, particularly focusing on improving their previous work. They clearly expect to be rewarded for their efforts by being promoted within the organization. They see this as their most likely avenue of progression as well as their most preferred route.

Project Orientation

This is probably the most interesting of the three groups since it least fits previous descriptions of career orientation groups. People with this orientation are among the oldest and most experienced in the organization. Their experience comes from their considerable tenure within the organization as well as their extensive experience outside the lab. They are the least well educated of any of the groups, but they tend to stay current on developments in their field by attending professional conferences. They are the best read professionally of any of the three groups. They are also among the most satisfied people in the organization.

In many ways, they are quite similar to the technical ladder group. They share with that group an interest in projects that are technically challenging and demanding. They enjoy becoming deeply involved in the details of their projects, choosing to be more specific in their knowledge rather than being broad based. They seek to discover the underlying principles in their work that fills out their knowledge of the

subject being studied. Like the technical ladder people they have a low need for affiliation, preferring to do their own work and letting others do theirs. It is this intense interest in the intracacies and details of their work that most differentiates them from the managerial ladder group.

The key difference between people in this category and those in the technical ladder group is their reduced desire to get ahead. They have the lowest need for achievement score of any of the three groups and they don't particularly value assignments that would be likely to enhance promotion possibilities. This was particularly evident in their relative lack of desire to improve on their past performance. They believe that if they perform at a high level they will not be moved up in the organization, but will continue to be assigned to interesting and challenging projects. Of the three career reward options available, they least want or expect to be a manager.

Discriminant Analysis

The summary descriptions of the three orientation categories presented above are composite pictures based on a cumulative analysis of the data. In order to determine whether the characteristics that have been defined as unique to each group are discriminating variables, a discriminant analysis was performed. If, based on the responses to items mentioned throughout this analysis, a high percentage of the cases can be properly classified into the three orientation categories, the orientation construct would be shown to have greater validity. The items that were selected as discriminating variables are found in Table XIII. All demographic variables were removed from consideration. The discriminant analysis is entirely consistent with what has already

been presented: All the items selected as discriminating between groups variables are mentioned earlier as showing significant differences between groups.

TABLE XIII

Items Used in the Discriminant Analysis

Organizational Opportunities

It is important to me to work on technically challenging tasks and projects.

It is important to me to work on projects that will lead to my organizational advancement.

Problem Solving Approaches

I prefer to probe deeply and thoroughly into selected areas even though they may be narrow.

Expectation of Organizational Reward

Expectation of movement up a technical ladder.

Expectation of movement up a managerial ladder.

Expectation of movement from project to project.

The classification table produced by the analysis shows that nearly 70% of the respondents were successfully classified into their orientation categories. (Table XIV) A closer look at the classification table is useful because the error factors for each of the three groups are consistent with our earlier analysis. For example, 71% of the people in the project orientation were correctly classified. The greatest number of people incorrectly classified were placed in the technical ladder category. This is not surprising, since the two groups, as noted earlier, are similar in many ways. The people in the project group are least like those in the managerial orientation, and

only nine people were incorrectly placed in that category.

TABLE XIV

Classification Table from Discriminant Analysis

Actual Group	Predicted group 1	Predicted group 2	Predicted group 3
Technical ladder orientation $_{(n=43)}$	27 (62.8%)	9 (20.9%)	7 (16.3%)
Managerial ladder orientation $_{(n=44)}$	12 (27.3%)	30 (68.2%)	2 (4.5%)
Project orientation $_{(n=118)}$	25 (21.2%)	9 (7.6%)	84 (71.2%)
		Total Predicted Correctly: 69%	

The same is true of the managerial ladder category. These people are most like the technical ladder group, since both groups share an interest in advancement, and are least like the project group, with whom they have little in common. The greatest number of incorrectly placed people should be found in the technical ladder group and the least number in the project orientation categories. A look at the classification table shows this to be the case. For people in the technical ladder group, who have something in common with both the two other groups, the error is more evenly spread between the two incorrect categories.

At this point, it is clear that the three categories created using the career orientation questions do represent different types of engineers. They have many things in common (as one would expect from a vocationally homogenous group) but there are many differences. Just what impact that

has and which job and leadership characteristics they find satyisfying will be explored in the next section.

Implications

The above analyses clearly show that there are three different career orientations. People who have these orientations differ from each other in the way they approach problems, in what they value in their work, in what motivates them and in what they expect from their employer. It is logical that people with different career orientations would respond differently to certain job and leadership characteristics. Based on what is known about each of the three orientations, it should be possible to predict which leadership and job characteristics each group would find most appealing and most satisfying. An analysis of the results of those predictions would increase understanding about those who have different career orientations.

To carry out this analysis, three scales were created from a set of questions describing a variety of job characteristics (See Appendix 1). The first scale deals with the level of technical challenge and development associated with a project. The second scale concerns the amount of influence or control that a person has over decisions made about his project. The third scale, a single item, is a measure of the feedback provided by the job itself. These three scales were chosen because they represent important issues for each of the three groups.

The analysis was done by correlating satisfaction with these three scales for each of the orientation categories. Based on the

descriptions of the three groups presented earlier. Three hypotheses emerge: (1) For the technical development scale, the highest correlations with satisfaction will be found in the two technically oriented groups. (2) For the influence scale, the managerial group will have the highest satisfaction correlations. (3) The two advancement oriented groups will have the highest correlations between satisfaction and the feedback scale. This fits with the high achievement needs of these two groups.

TABLE XV

Correlations with Satisfaction and Job Characteristics

	Technical challenge/ development	Influence over work	Job provides feedback
Technical ladder orientation	.63**	.28&	.40*
Managerial ladder orientation	.61**	.72**	.62**
Project orientation	.61**	.33**	.42**

&= Significant at minimum of .05 level
*= Significant at minimum of .01 level
**= Significant at minimum of .001 level

The results did not entirely match with expectations (Table XV). For the technical challenge and personal development scale, all three orientation categories showed high correlations with satisfaction. Although this is not the expected result, it should not come as a complete surprise. The section on Organizational Opportunities suggested that all three groups highly valued work assignments that were challeng-

ing. These results appear to echo that earlier finding. All groups are highly satisfied with challenging projects. People with different career orientations may differ in what they find challenging in a project, and they may differ in the degree to which they become involved with the details of the project, but they all appear to value challenging work.

The findings from the influence scale are much more consistent with previous expectations. Those with a managerial orientation are more satisfied with assignments in which they have high influence than are the other two groups. This indicates a need for control among people with this career orientation. It is apparently less important for the people in the two more technically oriented groups to have direct influence over the decisions made about their projects.

The correlations for the third scale also differ somewhat from expectations. The high correlation with satisfaction and job feedback for people with a managerial ladder orientation was not surprising because of their desire to improve on their performance. The lower correlation for the technical ladder group is puzzling, since desire to improve on performance was equally important for this group. One explanation is that this item may be incomplete measure of feedback because feedback also comes from supervisors and project leaders. A similar scale in the next section (Leadership Characteristics) is much more consistent with expectations than is this job feedback item.

The results of this analysis of job characteristics scales have been mixed. Clearly, the managerial ladder group find jobs in which they have high control more satisfying. All groups appeared to want

to work on challenging projects. Although all three groups showed high levels of satisfaction with feedback from the work iteself, the managerial ladder people seemed to place a particularly high value on this job characteristic.

Leadership Characteristics

A similar analysis to that described above was performed using four subscales created from two sets of items describing leadership characteristics (See Methods Section). Once again, correlations were run between satisfaction and these four scales for each of the orientation categories. The first of the scales addresses the extent to which the project manager was perceived as being aware of current developments in the profession. The first hypothesis is that the two technically oriented groups would have the highest satisfaction correlations for this scale, with the technical ladder group having a particularly high score. The second scale deals with the feedback given by the project manager and included items involving the recognition and reward of high performance. The two advancement oriented groups should have the highest correlations with this scale. The perceived technical competence of the manager, the third scale, should be particularly important for the two technically oriented groups. The last scale, a single item, deals with the extent to which the project manager encourages project members to participate in decision making. People with a managerial ladder orientation should find this characteristic particularly important. Two points are important before discussing the data (Table XVI). Prior to this analysis, all managers were removed from the orientation categories. This not only changes the number of people in each of the categories,

but also alters the nature of each of the groups. The results that are presented cannot in any way be considered conclusive, but they may well serve to clarify some of the differences that exist among groups.

The second point is that only project manager characterisitics are considered here. Identical data were collected for functional managers, but were not considered in this analysis. While the mean scores of the items for project and functional managers were similar, the correlations with satisfaction may well be different.

TABLE XVI

Correlations With Satisfaction and Perceived Project Manager Characteristics

	Aware of prof. developments	Provides feedback rewards achievement	Technically competent	Allows partic. in decisions
Technical ladder orientation	.43**	.46**	.36*	.35*
Managerial ladder orientation	-.05	.36*	-.30	.27
Project orientation	.13	.15	.12	.05

*=Significant at minimum of .05 level
**=Significant at minimum of .01 level

The results for the leadership characteristics scales are much more in line with expectations than were the results of the job characteristic scales. The results for the scale measuring leader awareness of professional development are about as expected. The technical ladder group

had the highest correlation with satisfaction and the managerial ladder people had the lowest. This is consistent with earlier findings which showed the technical ladder group to be the most interested in the latest professional developments.

The results of the feedback scale are particularly interesting. Both the advancement oriented groups appear to value feedback from their project leader much more than do people who have a project orientation. This, with the results of the feedback scale in the job characteristic section, gives a much better picture of the type of feedback people value. Technical ladder people value both feedback from the job itself and feedback from the job more highly than feedback from a supervisor. The project oriented people value only feedback from the job. Evaluations and recognition from the project manager seems to make little difference to them.*

The third scale, which correlates satisfaction with the project managers perceived technical competence, is noteworthy. That the two highest correlation coefficients are those of the two technically oriented groups is not unexpected, but the strong negative correlation for the managerial ladder group is somewhat surprising. One possible explanation is that since people with a managerial orientation are less concerned with a detailed investigation of their work assignment, they may be uncomfortable with a project manager who has a strong technical background. Such a project manager could place demands on his people for increased technical competence and involvement.

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* In fact, none of the project manager characteristics seems to have a great deal of influence on the satisfaction of those in the project group. The various job characteristics, on the other hand, seemed to make a great deal of difference.

The measure of involvement in decisions also showed results that are consistent with the previous descriptions of the career orientation categories. Both advancement oriented groups have higher satisfaction scores than the project group. The questions did not differentiate between technical and more managerial decisions, so it is entirely reasonable that both groups should value such involvement.

In general, the leadership characteristic scales are more in line with the previous understanding of the orientation categories. As mentioned, the differences between the scores of different groups are not generally statistically significant, and therefore are not entirely trustworthy. However, they do serve as an illustration of some interesting trends which appear to be in line with the differences that exist between people with different career orientations.

Conclusions

The results of this analysis show that there are at least three separate career orientations among R&D engineers. People with differing career orientaitons are characterized by contrasting background variables and divergent attitudes and values about their work. In addition, people with these various career orientations appear to be motivated by distinctly different aspects of their work life. They find different leadership and job characteristics satisfying, and they also place different values on various organizational rewards.

These findings have some interesting implications. Research and Development organizations that seek to motivate their engineers only by the promise of organizational advancement are clearly ignoring an important segment of their employees. If this sample is at all representative of R&D engineers generally, a large number of engineers are not particularly interested in advancement. These people appear more interested in the challenge of doing the work itself. Interesting and challenging assignments should no longer be considered only as a means of moving toward organizational advancement, but should be regarded as rewards in and of themselves. Bailyn (1978) discusses the importance of a pluralistic reward system, which would provide a variety of incentives and rewards for high performance. This study supports that recommendation.

To better understand these career orientations, considerable future research is needed. Although people with each of the orientations merit additional investigation, particular empha-

sis should be placed on people with a project orientation. This orientation least fits the descriptions of other career orientations mentioned in the literature. Of particular interest would be the relationship between career orientation and performance for this group.

As noted at the outset, a large number of people were left unanalyzed in this study. This was done for purposes of clarity. To leave this group unexplored, however, would be negligent. Additional work is necessary to analyze the career orientations of these people.

Finally, additional research is necessary on the organizational level variable which seem to influence the choice of career orientation. In this study, the criterion for inclusion into the project category was tightened to compensate for what appeared to be a cultural or organizational bias toward that response. Other such factors may exist which constrain or influence a person's career orientation. An analysis of those organizational level variables may prove to be very helpful in understanding career orientations among engineers.

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